

Section 12 Contents

12.1	Introduction	12-1
12.2	Setting	12-1
12.3	Policy Issues and Recommendations	12-2
12.4	Local Regulatory Organizations	12-3
12.5	Water Quality Problems	12-3
12.6	Water Quality Needs	12-5
12.7	Alternative Solutions	12-7

Tables

12-1	Wastewater Treatment Facilities	12-2
12-2	Rivers/Streams Assessed for Water Quality	12-6
12-3	Lakes/Reservoirs Assessed for Water Quality	12-6

Section 12

State Water Plan-Cedar/Beaver Basin

WATER QUALITY

12.1 Introduction

Passage of the Utah Water Pollution Control Act of 1953 ushered the state into maintaining high quality water resources. The Federal Water Pollution Control Act in 1972 brought about major changes, particularly in the wastewater treatment plant program.

The Utah Water Quality Board has adopted regulations and set water quality standards. These are enforced statewide. Significant progress has been made on improving water quality since 1972, but there is still much to be accomplished.

In 1984, the Governor of Utah issued an executive order to prepare and implement a plan for the protection of groundwater. As a result, the Utah Department of Environmental Quality prepared, and after public comment, implemented the *Ground Water Quality Protection Strategy for the State of Utah*.⁴

12.2 Setting

There are two types of water pollution, background pollution from geologic contributions and those that are man caused. Man caused pollution comes from either point or non-point sources (NPS).

Pipe discharges from such things as industrial processes or wastewater treatment plants are examples of point sources. Cedar City is the only discharge permittee in the Cedar/Beaver Basin.

Many of the communities use individual family septic tanks. The balance of the communities use lagoons. The communities with wastewater treatment facilities are listed in Table 12-1.

NPS pollution comes from diffuse sources such as overland flow from agricultural land or from gully erosion. Other NPS pollution comes from rangeland uses, mining, construction and urban runoff. For example, there is the potential for groundwater contamination from runoff from mine tailings around the area. Also, where these materials are used in construction, an additional source of pollution is introduced.

Streams in the basin flow from areas considerably different from each other in geology, land use, vegetation, altitude and climate. Water quality is measurably affected by these differences. The kinds of minerals dissolved in water and affecting water quality are determined by rock and soil composition, climate, biological effects of plants and animals, and water management and use as the water flows downstream.

Geologic pollution of surface water comes from areas where sediments are eroded from the land surface and are washed into rivers and streams. The sediments

■ Safeguards to protect water quality must be provided by society as this resource is very important and often fragile. Natural environmental processes can remove pollutants from water to some extent, but there are definite limits.



Windmill near Milford

**Table 12-1
WASTEWATER TREATMENT FACILITIES**

Facility	Type	Disposal Method
Beaver	Lagoon	Total containment
Cedar City	Mechanical	Discharging
Enterprise	Lagoon	Total containment
Milford	Lagoon	Total containment
Minersville	Lagoon	Total containment
Parowan	Lagoon	Total containment

contain various chemicals depending on the source. Geologic contamination of groundwater occurs as it moves through bedrock and alluvial aquifers, leaching out the chemicals. This type of pollution is difficult to control.

When natural erosion levels are high, it is generally because of low densities of native vegetation, steep gradients and unstable substrates. This erosion can contribute to sediment loading, turbidity, concentration of trace elements, high biological oxygen demand and salinity. Accelerated erosion from man-caused sources compounds these same problems.

The Division of Water Quality is initiating a more formal water quality planning process called the Watershed Approach. This will be a systematic effort to be carried over a five-year cycle which will cover an entire watershed and/or groundwater recharge area and will incorporate all of the divisions water quality programs. This will allow an intensified monitoring program and will fit the National Point Discharge Elimination System programs licensing cycle.

12.3 Policy Issues and Recommendations

There are two issues pertaining to water quality. These concern water quality monitoring and management throughout the basin.

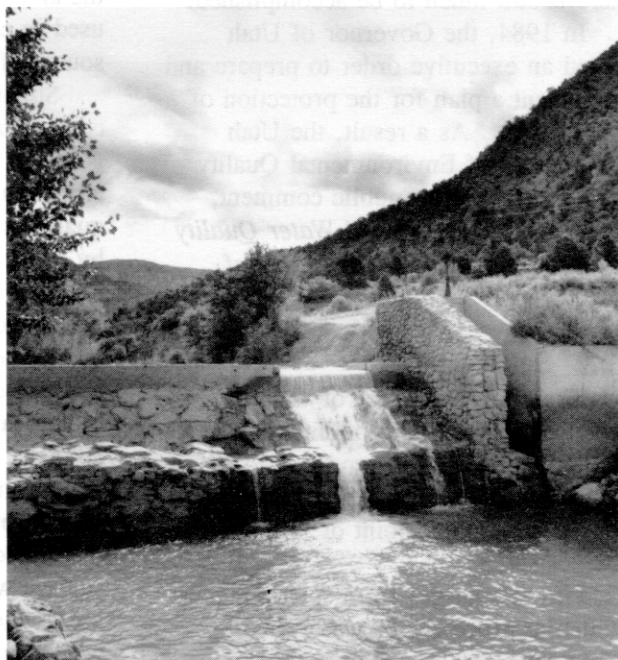
12.3.1 Groundwater Quality Monitoring

Issue - There is a need for more water quality data. A more intensive water quality monitoring program is needed to provide data for better groundwater management

Discussion - The water quality in all of the groundwater reservoirs in the basin is deteriorating at varying rates. This is caused by continued use resulting in recirculation of the groundwater, primarily from current irrigation practices. Water is pumped from the

groundwater reservoir for irrigation and applied to the cropland. Water applied in excess of crop needs percolates beyond the root zone and returns to the groundwater reservoir. During this process, chemicals are leached from the soil into the groundwater, reducing the water quality. A more intensive water quality monitoring program will provide data for better groundwater management.

The water quality is deteriorating in the Milford and Beryl-Enterprise areas at a faster rate than elsewhere in the basin. The quality in Cedar Valley and Parowan Valley is declining slightly, while Beaver Valley groundwater quality remains fairly constant. Groundwater reservoirs are shown on Figures 5-9, 11-1 and 19-1.

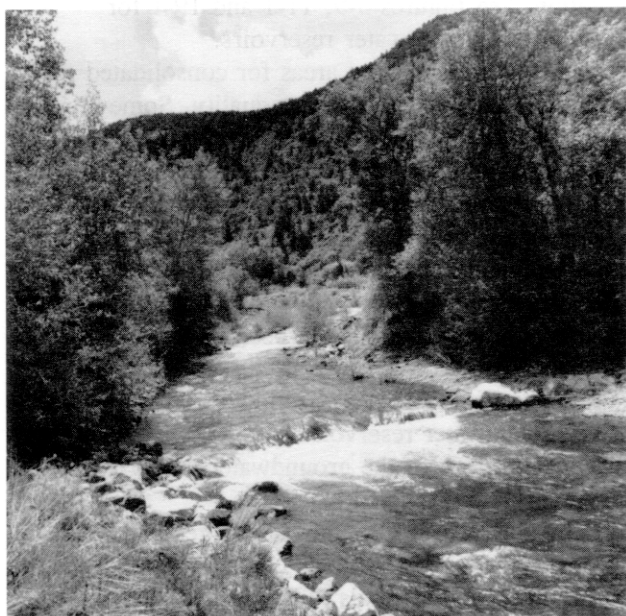


Diversion in Cedar Canyon

There is potential for contamination of groundwater around Rush Lake, Little Salt Lake and especially in the Quichapa Lake area. A large part of the Cedar City culinary water supply comes from this area. If the high quality water is over pumped, a cone of depression may develop. This would allow lower quality water from the central part of the valley to intrude, contaminating the high water quality area.

In addition, more data will be needed to evaluate the new hog production facility and how it may or may not impact the groundwater quality. Data will also be needed to determine any future changes. Existing permits allow the proposed disposal of the solid and liquid wastes by a combination of anaerobic sewage lagoons and land application of lagoon-treated water to field crops. The treated water will be mixed with irrigation water and applied to crops, probably alfalfa, by sprinkler systems. Both of these, the sewage lagoons and the application of waste water to fields, will need to be monitored. This is especially a concern where there may be a possible contamination of the culinary water supplies in the future. A report is being prepared by the U.S. Geological Survey on a study of this situation.

The impact of groundwater quality problems is likely to increase in the future. Increased long-term monitoring is imperative in order to manage the groundwater reservoirs. This will require an increase in program funding. The monitoring program funding



Cedar Canyon

should be shared at the local, state and federal levels. However, current technology for better nutrient management and other practices to reduce or eliminate pollution of the groundwater should be used now.

Recommendation - The Water Quality and Water Rights divisions, in cooperation with the U.S. Geological Survey, should develop and carry out a groundwater quality monitoring program with assistance from local units of government.

12.3.2 Areawide Water Quality Management Plan

Issues - The areawide water quality management plan for this area, prepared a number of years ago, is now outdated.

Discussion - A water management plan was prepared for this area over 10 years ago. This plan now needs to be updated to better deal with the existing conditions in the basin. There is a greater demand now for high quality culinary water. This need will increase into the future. In order to provide water of adequate quality for all uses, data is needed so the various water suppliers can best manage their resources. The demands for municipal and industrial water will increase faster than all other uses. Recreational demands for water-based facilities will also increase.

Recommendation - The Division of Water Quality, with assistance from other entities as needed, should update the *Five-County Areawide Water Quality Management Plan* to reflect current problems and solutions.

12.4 Local Regulatory Organizations

Towns, cities and counties all have primary responsibilities for water quality within their respective entities. These responsibilities and authorities are contained in Titles 10, 11, 17, 19 and 73 of the *Utah Code Annotated, 1953*, amended.

The Board of Health, Southwest Utah Public Health Department, also has certain responsibilities for the control of public waste water, water pollution, septic tank construction and installation, and vector (mosquito) control. These duties are carried out through their staff. The Southwest Utah Public Health Department and the Utah Department of Environmental Quality work together on related regulations and activities.

12.5 Water Quality Problems

The Five-County Association of Governments, Utah Department of Environmental Quality, U.S. Geological Survey and others have reports and data on

the water quality in the Cedar/Beaver Basin.⁶¹ These should be studied by those interested in more detailed information than is presented in this report.

Water quality problems in the basin can be caused by one or more of several sources. Pollution from natural geologic conditions is almost impossible to control. This type of pollution becomes more evident as the high water quality in the upper watersheds decreases as the rivers and streams flow downstream.

Other sources of pollution include contaminants from man-caused non-point sources. Runoff from pastures and over-fertilization of agricultural croplands can also pollute water supplies. Concerns have been expressed about contamination from sewer lagoons and dense concentrations of septic tanks. There are also concerns about water treatment plant effluent contaminating the groundwater. Bacterial contamination can be a problem along with chemical pollution.

To help control the water quality, the streams and lakes in the state of Utah are assigned standards for maximum contaminant levels according to four major beneficial use designations.

These uses are (1) As a source for drinking water (2) for swimming and indirect contact recreation, (3) stream/lake/wetland dependent fish and wildlife and (4) agriculture.

12.5.1 Surface Water Quality Problems

Surface water quality measurements were conducted on selected streams during the 1960s.⁶² Coal Creek yields more sediment volume than any other stream in the basin. Concentrations varied from 200 to 500 mg/l during base period flows of 20 to 30 cubic feet per second (cfs). Flood flows of 1,200 cfs yielded sediment concentration of nearly 700,000 mg/l or 2.3 million tons per day. The total dissolved solids (TDS) ranged from 447 mg/l to 1,410 mg/l.

Sediment loads in the Beaver River ranged from 2 mg/l to over 1,200 mg/l. The TDS ranged from 64 mg/l to 163 mg/l near Beaver. At Adamsville, the TDS ranged from 160 mg/l to 526 mg/l.

Nine streams have been targeted for monitoring of water quality, but only two have been assessed. These are listed in Table 12-2. Eight lakes/reservoirs have been assessed. These are listed in Table 12-3.

Two watersheds, Shoal Creek and Beaver River, are on the Division of Water Quality Section 319, Nonpoint Source Priority Watershed list. There is a Section 314 Clean Lake Project underway on Minersville Reservoir.⁴⁰ Other funds have been received under the Section 319 Program for a Nonpoint Source Demonstration Project on the Beaver River

between Beaver City and Minersville Reservoir. A local steering committee is being formed to start the Coordinated Resource Management Plan.

The Beaver River and Minersville Reservoir do not fully support the use classes for a cold water fishery and water-related recreation activities. Nutrients (including dairy wastes), sediments and hydrologic modification to the riparian zone, primarily from agricultural sources, are the predominate pollutants.

Fishing in Minersville Reservoir is impaired due to the warm water temperatures in late summer which permits the growth of a parasitic species. This parasite impacts the health of fish and makes them less desirable to fishermen. Water-skiing and swimming are impaired due to large amounts of algae growth in the summer months. Preliminary data indicates the reservoir stratifies, causing dissolved oxygen depletion to a point that anoxic conditions exist in the lower hypolimnion.

Coal Creek near Cedar City does not support the cold water fishery beneficial use class. This is caused by a high level of the metals iron and copper coming from natural sources accelerated by man induced erosion.

12.5.2 Groundwater Quality Problems

Many potential sources of groundwater pollution exist. These include sources from agricultural operations, various types and methods of waste disposal, and operations such as mining and oil and gas exploration. See Figures 5-9, 11-1 and 19-1 for location of the groundwater reservoirs.

Groundwater recharge areas for consolidated rock and alluvium are critical to water quality. Some aquifers, where high quality water is now found, are vulnerable to pollution by the activities of people. In potential recharge areas where the aquifer is exposed, it can be contaminated by precipitation and streamflow leaching pollutants left in or on the land. Alluvial aquifers are especially vulnerable to pollution. In some cases, the aquifers have already been adversely affected by the activities of people.

Refer to Figure 11-1 in Section 11 which shows the five groundwater reservoirs and the areas of higher quality water. Each of the groundwater reservoirs and water quality are discussed below.

Beaver River⁴⁵ - Groundwater is generally of good quality with most samples containing 300 mg/l or less of total dissolved solids (TDS). The TDS in the groundwater reservoir is lowest in the upper or younger unconsolidated alluvium and increases with depth as well as toward the southwest end of the valley. The

lower part of the reservoir consists primarily of the Sevier River formation with TDS reaching as high as 1,000 mg/l.

Milford⁴⁶ - The TDS ranges from 226 to 4,600 mg/l north of T. 29 S. and from 253 to 1,100 mg/l to the south. This is probably because of the difference in deep percolation of irrigation water and the amount of fine grained soils in the area. In general, the quality of water pumped from wells has deteriorated over the years. This is probably the result of recycling of irrigation water and encroachment of groundwater from outside the area.

In the area south of Milford, the quality of water from one well increased from about 400 mg/l total dissolved solids (TDS) in 1950 to over 1,400 mg/l in 1992. One year, 1983, was exceptionally high with a TDS of over 1,900 mg/l.

In general, the TDS for culinary water used in the area slightly exceeds the standard recommended by the state of Utah, although the sulfate, chloride and nitrate concentrations are below the limits. Irrigation water is classed as low-sodium hazard with medium to high salinity concentrations. These classifications are acceptable under proper management practices, particularly with the high salinity.

Parowan Valley⁷ - The public water supply systems all deliver water that meets the standards established by the state of Utah. The groundwater is generally classified as sodium, calcium or magnesium bicarbonate. The irrigation classification is low sodium hazard and low to high salinity concentrations. The quality of water is high in the upper watershed areas but deteriorates as it flows downstream. However, the irrigation water meets the standards for agricultural use.

The groundwater quality from selected wells and springs ranges from 158 to 481 mg/l of total dissolved solids (TDS). The groundwater underlying Little Salt Lake has a high mineral concentration, mostly sodium chloride. During dry periods, the surface water in the lake can contaminate the surrounding aquifers.

Samples from a well west of Paragonah have tested fairly constant at concentrations between 275 mg/l total dissolved solids and 325 mg/l. There was a peak in 1973 to about 875 mg/l.

Cedar City Valley⁷ - The groundwater in the Cedar City Valley area is generally classified as a calcium or magnesium sulfate type. The total dissolved solids (TDS) measured from selected wells and springs ranges from 408 to 2,100 mg/l. The groundwater is classified as very hard. Generally the water used for public supply systems is below the recommended

maximum limits.

The groundwater has a low sodium hazard, but it has medium to very high salinity concentrations. All water in the basin is suitable for agricultural uses. In one well in the southern part of the basin, there was an indication of a general increasing trend from 380 mg/l in 1974 to 540 mg/l in 1985. There has been a sharp decrease to 350 mg/l since, declining to the lowest level since 1969.

Beryl-Enterprise Area^{44,47} - The concentration of TDS in the groundwater in the Beryl-Enterprise area is highest at the water table surface and decreases with depth. This is caused by return flows from irrigation of water leaching salts out of the soils. However, most of the wells are perforated from top to bottom so the samples are a composite of the tapped aquifer. A few of the wells tested exceed 1,000 mg/l but the majority are between 500 and 1,000 mg/l. One exception is a narrow belt between Enterprise and Beryl where it is less than 500 mg/l.

North of New Castle, the sulfate and chloride concentrations exceed the maximum standards for domestic use. In the southern part of the valley, five wells showed concentrations of nitrate exceeding the limit. Most of the water is hard to very hard.

Most of the water in the area has a low sodium hazard except for the area north of Newcastle to Table Butte where it increases. The salinity concentrations are medium to high. All of the water in the area is suitable to use for irrigation and for livestock watering.

The groundwater near the recharge areas is of higher quality than in those areas farther downgradient. This is because of deep percolation of irrigation water and evapotranspiration in the bottom land areas. The recharge is primarily from drainages in the southern part of the valley. These are Pinto Creek, Meadow Creek, Spring Creek and Shoal Wash. The surface water quality is good, generally less than 500 mg/l TDS.

The quality of the groundwater in the Beryl-Enterprise area is decreasing. The total dissolved solids in a well south of Beryl was 460 mg/l in 1967, increasing to about 650 mg/l in 1992.

12.6 Water Quality Needs

Man-caused pollution along with natural causes effect the water quality in the Cedar/Beaver Basin. In addition, recent and future growth and development will create changes in water use and will further impact the water quality. The following ongoing water quality and monitoring programs are needed so the basin water resources can be adequately analyzed.

**Table 12-2
RIVERS/STREAMS ASSESSED FOR WATER QUALITY**

Stream	Assessment
Shoal Creek and tributaries	Not assessed
Pinto Creek and tributaries	Not assessed
Coal Creek and tributaries	Impaired
Parowan Creek and tributaries	Not assessed
Summit Creek and tributaries	Not assessed
Little Creek and tributaries	Not assessed
Red Creek and tributaries	Not assessed
Beaver River and tributaries	Impaired
Cove Creek and tributaries	Not assessed

**Table 12-3
LAKES/RESERVOIRS ASSESSED FOR WATER QUALITY**

Lake/Reservoir	Assessment
Upper Enterprise Reservoir	Eutrophic ^a
Newcastle Reservoir	Eutrophic
Red Creek Reservoir	Mesotrophic ^b
Anderson Meadow Reservoir	Mesotrophic
LaBaron Lake	Mesotrophic
Puffer Lake	Mesotrophic
Three Creeks Reservoir	Mesotrophic
Minersville Reservoir	Eutrophic

^a Water very rich in nutrients, low dissolved oxygen and high BOD

^b Water with a moderate amount of nutrients.

- Routine and intensive monitoring is needed. There may be locations where monitoring is needed of exceptional events.
- A detailed inventory of severely eroding watersheds is needed. (Refer to Section 10.5 and Figure 10-1 for more information.) This will provide a base for monitoring of best management practices (BMPs) applied to critical areas. Also, testing of surface water as

well as groundwater is needed to determine if and where nutrient (fertilizer) and/or pesticide contamination has occurred.

- Further studies and sampling are needed of lakes and reservoirs, and of water quality near mines and geothermal wells.
- Contamination and its extent due to faulty septic tanks and leaking underground storage tanks can be determined by monitoring.

In addition, riparian communities need to be re-established along parts of the river corridors where recreational impacts and grazing have destroyed the vegetation and compacted the soils. These impacts increase runoff which in turn increases salt and suspended solid in the streams. Many of the stream segments where riparian vegetation has been severely damaged are located in areas where there is accelerated erosion. Refer to Section 10-5 and Figure 10-1 for more information.

12.7 Alternative Solutions

Non-point sources are the biggest contributors to water pollution in the Cedar/Beaver Basin. These sources are primarily geologic, but are also man-caused.

Pollution caused by man's activities can be controlled or at least reduced. Landfill locations can be controlled by elected officials and government agencies working together. They should be located in areas where surface water or groundwater will not become contaminated through leaching or runoff. Controls on construction and other land surface disturbances will also reduce pollution.

Over irrigation is contributing to pollution of the groundwater reservoirs by leaching chemicals out of the soil. There is technology available to help reduce this source of pollution. The use of pesticides has also contributed to the problem and better control of this use would help reduce pollution. Basically, increasing irrigation efficiencies can go a long way toward reducing this problem. Nutrient management, hayland management, cropping sequence and waste utilization are good alternative solutions.

In some areas, domestic livestock and/or wild animals or other causes have depleted the land cover. Practices to re-establish vegetation will reduce erosion and the resulting pollution.

All local government entities should work with state agencies in implementing local groundwater protection programs. Groundwater recharge areas should be identified, zoned and use controlled where there is danger of contamination. Two critical areas are the Parowan Creek and Coal Creek fans.

The Environmental Protection Agency 301k program administered by the Division of Water Quality and carried out by the Utah Department of Agriculture can provide funds and technical assistance to reduce non-point pollution in critical watersheds. Some of the critical watersheds are shown in Figure 10-1. In these areas, controlling erosion and the resultant sediment production can reduce contamination of surface water flows. ■ ■